

IN THE SPECIFICATION

Change the paragraph at page 2, lines 19-23 to read:

The invention relates to a method for adhering a polybutadiene formed article, which comprises

(1) the step of reducing the water contact angle of a surface of the polybutadiene formed article by ozone treatment (hereinafter also referred to as "step (1)"), and

Change the paragraph at page 2, lines 24-27 to read:

(2) the step of adhering the above-mentioned polybutadiene formed article which is reduced in the water contact angle by ozone treatment to a polar resin formed article (hereinafter also referred to as "step (2)").

Delete the paragraph at page 3, lines 4-9:

~~Further, the above mentioned step (1) includes at least one selected from the group of ozone treatment, electron beam treatment, corona discharge treatment, plasma discharge treatment, radiation (X ray, α ray, β ray) treatment, ultraviolet treatment, ultraviolet laser treatment and chemical treatment.~~

Change the paragraph at page 3, lines 13-18 to read:

The above-mentioned polar resins include at least one selected from the group of a polycarbonate resin, a polyester resin, an ABS resin, a polystyrene resin, a polyurethane resin, ~~a polyamide resin,~~ a polyalkyl acrylate resin, a polyalkyl methacrylate resin, a polyvinyl acetate resin, polyvinyl chloride and a polyvinylidene chloride resin.

Change the paragraph at page 4, lines 19-26 as follows:

According to the invention, polar groups are planted on a surface of the above-mentioned polybutadiene formed article by ozone treatment, ~~or the surface is roughened to reduce the water contact angle of the surface of the polybutadiene formed article~~, thereby being able to improve the joining (adhesion) force with the polar resin formed article. Moreover, the solvent(s) for these formed articles is selected (combined), thereby being able to further improve the joining force.

Change the paragraph at page 6, lines 9-17 to read:

Syndiotactic 1,2-polybutadiene having a crystallinity of up to about 5 to 25% ~~by weight~~ (hereinafter also referred to as "low crystalline RB") is excellent in flexibility, so that it is used as a main part of the tube. However, the low crystalline RB is inferior in steam sterilization resistance because of its low melting point (melting point = about 70 to 95°C). It is therefore desirable to crosslink it by electron beam irradiation, thereby giving heat resistance, as described later.

Change the paragraph at page 6, lines 18-23 to read:

On the other hand, syndiotactic 1,2-polybutadiene having a crystallinity of about 25 to 40% ~~by weight~~ (hereinafter also referred to as "high crystalline RB ") is relatively high in melting point (melting point = about 105 to 140°C), but high in hardness and inferior in flexibility. Accordingly, this can be preferably used as the connector.

Change the paragraph at page 8, lines 12-26 to read:

Syndiotactic 1,2-polybutadiene (A) used in the invention is obtained by polymerizing butadiene, for example, under the presence of the catalyst containing the cobalt compound and the aluminoxane, as described above. The above-mentioned cobalt compounds include

preferably an organic acid salt of cobalt having 4 or more carbon atoms. Specific examples of the organic acid salts of cobalt include a butyrate, a hexanoate, a heptylate, an octylate such as ~~2-ethylhexyli acid~~ 2-ethylhexylate, a decanoate, a salt of a higher fatty acid such as stearic acid, oleic acid or erucic acid, a benzoate; an alkyl-, aralkyl- or allyl-substituted benzoate such as a tolylate, a xylylate or an ~~ethylbenzoic acid~~ ethylbenzoate, a naphthoate and an alkyl-, aralkyl- or allyl-substituted naphthoate. Of these, ~~2-ethylhexylic acid~~ 2-ethylhexylate or a so-called octylate, a stearate and a benzoate are preferred for excellent solubility in a hydrocarbon solvent.

Change the paragraph at page 15, lines 13-24 to read:

On the other hand, thermoplastic polymer (B) is a thermoplastic resin and/or thermoplastic elastomer other than the above-mentioned component (A), and specifically, at least one selected from the group consisting of ~~polyethylene~~, polypropylene, a styrene-butadiene-styrene block copolymer (SBS), a styrene-isoprene-styrene block copolymer (SIS), hydrogenated polymers thereof (SEBS and SEPS), polybutadiene (BR) other than the above-mentioned syndiotactic 1,2-polybutadiene, ~~1,2-polybutadiene~~, an ABS resin, polyisoprene, various polyethylenes (LLDPE, ULDPE and LDPE), an ethylene-vinyl acetate copolymer, an ethylene-acrylate copolymer and an ethylene-methacrylate copolymer.

Change the paragraph at page 23, lines 11-23 to read:

The polybutadiene formed article used in the invention indicates a tube formed of 1,2-polybutadiene as described above, a tube formed of a blend of 1,2-polybutadiene and a ~~styrene-isoprene~~ styrene-isoprene-styrene copolymer (SIS), a tube formed of a blend of 1,2-polybutadiene and a rubber, and a tube formed of a blend of 1,2-polybutadiene and an olefin resin. Of these, as for the combination with the ~~styrene-isoprene~~ styrene-isoprene-styrene

copolymer, there may be used either hydrogenated styrene-ethylene-propylene-styrene or a partially hydrogenated product thereof. As for the combination with the rubber, various rubbers can be used, but isoprene and natural rubber are preferred. As for the combination with the olefin resin, preferred examples of the resins include LDPE, L-LDPE and EVA.

Change the paragraph at page 23, line 26 to page 25, line 7 to read:

The polar resins used in the polar resin formed article of the invention include an ABS resin, a polystyrene resin, an acrylic resin, polyacrylamide, polyacrylic acid, a polyalkyl acrylate such as polymethyl acrylate or polyethyl acrylate, polyacrylonitrile, an acrylonitrile-styrene copolymer, polymethacrylamide, polymethacrylic acid, a polyalkyl methacrylate such as a polymethyl methacrylate resin or a polyethyl methacrylate resin, a polyurethane resin, polymethacrylonitrile, an acetal resin, polyoxymethylene, an ionomer, chlorinated polyethylene, a coumarone-indene resin, regenerated cellulose, a petroleum resin, a cellulose derivative, alkali cellulose, a cellulose ester, cellulose acetate, cellulose acetate butylate, cellulose xanthate, cellulose nitrate, a cellulose ether, carboxymethylcellulose, a cellulose ether ester, a fluororesin, FEP, polychlorotrifluoroethylene, polytetrafluoroethylene, polyvinylidene fluoride, polyvinyl fluoride, ~~a polypolyamide such as nylon 11, nylon 12, nylon 6, nylon 6, 10, nylon 6, 12, nylon 6, 6 or nylon 4, 6, an aromatic polyamide such as polyphenyleneisophthalamide, polyphenyleneterephthalamide or metaxylylenediamine,~~ a polyimide, polyphenylene sulfide, polyether ether ketone, a polyamideimide, polyarylate, a polyester resin such as polyethylene terephthalate and polybutylene terephthalate, polyvinyl chloride, a polyvinylidene chloride resin, chlorinated polyethylene, chlorosulfonated polyethylene, a polycarbonate, CR-39, a polysulfone, a polyethersulfone, a polysulfonamide, polyvinyl alcohol, a polyvinyl ester, polyvinyl cinnamate, polyvinyl acetate, polyvinyl ether, polyisobutyl vinyl ether, polymethyl vinyl ether, polyphenylene oxide, ~~polybutylene~~

~~terephthalate~~ and the like as thermoplastic resins; and an amino resin, an aniline resin, a urea resin, ~~a polysulfonamide~~, a melamine resin, an allyl resin, a diallyl phthalate resin, an alkyd resin, an epoxy resin, a silicone resin, a vinyl ester resin, a phenol resin, a novolac resin, a resorcinol resin, an unsaturated polyester resin, a low-shrinkage unsaturated polyester, a furan resin and the like as thermosetting resins.

Change the paragraph at page 25, lines 8-13 to read:

Of these, the preferred polar resins include a polycarbonate resin, a polyester resin such as polyethylene terephthalate or polybutylene terephthalate, an ABS resin, a polystyrene resin, a polyacrylic resin, a polyurethane resin, ~~a polyamide resin~~, a polyvinyl acetate resin, a polyvinyl chloride resin and a polyvinylidene chloride resin.

Change the paragraph at page 28, lines 6-14 to read:

When the solubility parameter is within the abovementioned range, the water contact angle comes close to that of the polybutadiene composite formed article reduced in solubility parameter by ozone treatment, ~~electron beam treatment, corona discharge treatment, plasma discharge treatment, ultraviolet treatment, ultraviolet laser treatment and chemical treatment~~, thereby achieving the effect of obtaining high adhesion strength in solvent adhesion with a polar solvent.

Change the paragraph at page 29, lines 9-14 to read:

Step (1) ~~may be any process, as long as it is~~ a means for reducing the water contact angle on the surface of the polybutadiene formed article. Examples thereof include ozone treatment, ~~corona discharge treatment, plasma discharge treatment, excimer laser treatment, electron beam treatment, ultraviolet treatment or chemical treatment~~.

Delete the paragraphs beginning at page 31, line 1 through page 34, line 15:

[0063]

~~Electron Beam Treatment:~~

~~The electron beam treatment is performed by using an electron beam irradiation apparatus equipped with an electron beam accelerator in place of the above mentioned ozone generating apparatus, and irradiating the surface of the polybutadiene formed article to be treated, with electron beams generated by the electron beam accelerator. As the above mentioned electron beam irradiation apparatus, there can be used, for example, an apparatus which can emit uniform electron beams in a curtain form from linear filaments (for example, an electrocurtain type apparatus) or the like. The dose of electron beam irradiation at this time is usually 0.5 Mrad or more, preferably 1.5 Mrad or more, and more preferably 3 Mrad or more. The dose of electron beam irradiation is set to the line speed of a treatment film on an inlet side of the electron beam irradiation apparatus, and the upper limit thereof is not particularly limited. However, it is usually about 20 Mrad.~~

[0064]

~~Corona Discharge Treatment:~~

~~The corona discharge treatment is performed by using, for example, a known corona discharge treating apparatus, and allowing the polybutadiene formed article to be treated to pass through a corona atmosphere generated in an inert gas. The corona discharge density at this time is usually 10 (w-min/m²) or more, and preferably from 30 to 300 (w-min/m²). The above mentioned inert gases include argon, helium, krypton, neon, xenon and nitrogen as a simple substance, and a mixed gas of two or more thereof. In particular, nitrogen is industrially preferred. The above mentioned inert gas may contain oxygen at an oxygen concentration of 1% by volume or less, preferably 0.1% by volume or less and more preferably 0.01% by volume or less.~~

{0065}

~~Plasma Treatment:~~

~~As the plasma treatment, there are low-pressure plasma treatment and atmospheric plasma treatment. The low-pressure plasma treatment can be performed by electronically exciting the above-mentioned inert gas with a plasma jet in a low-pressure state of 0.1 to 5 Torr at an output of 200 to 1,000 W, then removing charged particles to make it electrically neutral, thus obtaining an excited inert gas, and bringing the excited inert gas into contact with the polybutadiene formed article to be treated. The treatment time at this time is from 10 to 60 seconds, and preferably from 20 to 40 seconds.~~

{0066}

~~Further, the atmospheric plasma treatment can be performed by applying an alternating current of 2 to 3,000 V at 3 to 5 kHz between electrodes in the above-mentioned inert gas to generate an excited inert gas similar to that in the low-pressure plasma treatment, and then bringing the excited inert gas into contact with the polybutadiene formed article to be treated. The treatment time at this time is from 10 to 60 seconds, and preferably from 20 to 40 seconds.~~

{0067}

~~Ultraviolet Laser Treatment:~~

~~As an ultraviolet laser, there is a laser having an oscillation wavelength of 180 to 360 nm, preferably 190 to 250 nm, and preferred is an excimer laser. Gases used in the excimer laser include KrF, KrCl, ArF, ArCl, F₂ and the like, each of which has a specific oscillation wavelength. For example, an ArF laser has an oscillation wavelength of 192 nm, and the photon energy thereof is 148 Kcal. Accordingly, it can sever a C-H bond having a bond energy of 100 to 110 Kcal, and hydrogen excited by excimer laser irradiation can be easily~~

~~drawn out. In place thereof, for example, a carbonyl group, a carboxyl group, a hydroxyl group or the like can be introduced by oxygen in the coexisting air, or the like.~~

[0068]

~~The dose of the excimer laser is from 15 to 25 mJ/cm², and preferably from 18 to 22 mJ/cm². That is to say, when the energy density is less than 15 mJ/cm², it is difficult to obtain the desired hydrophilicity. On the other hand, even when it exceeds 25 mJ/cm², not only the hydrophilicity is not improved any more, but also the surface of the polybutadiene formed article as a substrate is roughened.~~

[0069]

Chemical Treatment:

~~The chemical treatment is treatment of etching or deteriorating the polybutadiene formed article or treatment of introducing a functional group onto a surface thereof. Specific examples thereof include peroxide treatment of the foamed article with hydrogen peroxide or the like, treatment with an inorganic acid such as nitric acid, hydrochloric acid, sulfuric acid, chromic acid, a potassium permanganate solution or the like, treatment with a toluene solution of aluminum chloride or iron chloride, and the like.~~

~~As for conditions of the chemical treatment, the polybutadiene formed article is immersed in an acidic, neutral or basic solvent (including water) for 5 minutes to 48 hours with 2 to 50% by weight of any one of nitric acid, hydrochloric acid, sulfuric acid, chromic acid and potassium permanganate to be oxidized. A technique of heating at 30 to 50°C can also be used as needed.~~

Change the paragraph at page 34, lines 16-20 to read:

In the above-mentioned step (1), the above-mentioned ozone treatment[[,]] can be used alone or can be used in combination with electron beam treatment, corona discharge

treatment, plasma discharge treatment, ultraviolet laser treatment and chemical treatment ~~can be used alone or in combination.~~

Change the paragraph at page 35, lines 2-6 to read:

The reason for this is presumed that the water contact angle is decreased by introducing, for example, a functional group such as a carbonyl group, a carboxyl group, a hydroxyl group or an aldehyde group onto the surface of the polybutadiene formed article ~~or roughening the surface,~~ as described above.

Change the paragraph at page 38, lines 3-8 to read:

According to the invention, the polybutadiene formed article such as a tube treated by the ozone treatment ~~or the like~~ in step (1) is adhered to the polar resin formed article such as a connector, thereby obtaining the polybutadiene composite formed article in which the adhering portions are strongly adhered to each other.

Change the paragraph at page 39, lines 8-12 to read:

Further, in the invention, all of the connecting member 15, the drip chamber 11 and the connector 19 correspond to “the connector having a tube connecting portion”, and a polar resin such as a polycarbonate, a polyester, a transparent ABS or ~~vinyl chloride~~ polyvinyl chloride is used.

Change the title at page 41, lines 22-23 to read:

Preparation of Test Pieces for ~~Ozone Treatment and~~ Adhesion Test